

Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference 0000054646 | FOR FURTHER ACTION | See Form PCT/IPEA/416 |
| International application No. PCT/EP2004/006297 | International filing date (day/month/year) 11.06.2004 | Priority date (day/month/year) 25.06.2003 |
| International Patent Classification (IPC) or national classification and IPC | | |
| Applicant BASF AKTIENGESELLSCHAFT | | |

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| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>5</u> sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application |
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| Date of submission of the demand | Date of completion of this report |
| Name and mailing address of the IPEA/EP | Authorized officer |
| Facsimile No. | Telephone No. |

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2004/006297

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

- international search (Rule 12.3 and 23.1(b))
- publication of the international application (Rule 12.4)
- international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

the international application as originally filed/furnished
 the description:
 pages _____ as originally filed/furnished
 pages* 1-29 received by this Authority on 25.04.2005 with telefax
 pages* _____ received by this Authority on _____
 the claims:
 nos. 1-30 as originally filed/furnished
 nos.* _____ as amended (together with any statement) under Article 19
 nos.* _____ received by this Authority on _____
 nos.* _____ received by this Authority on _____
 the drawings:
 sheets _____ as originally filed/furnished
 sheets* _____ received by this Authority on _____
 sheets* _____ received by this Authority on _____
 a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. The amendments have resulted in the cancellation of:

- the description, pages _____
- the claims, nos. _____
- the drawings, sheets/figs _____
- the sequence listing (*specify*): _____
- any table(s) related to sequence listing (*specify*): _____

4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages _____
- the claims, nos. _____
- the drawings, sheets/figs _____
- the sequence listing (*specify*): _____
- any table(s) related to sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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International application No.

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Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|-------------------------------|--------|------|-----|
| Novelty (N) | Claims | 1-29 | YES |
| | Claims | | NO |
| Inventive step (IS) | Claims | 1-29 | YES |
| | Claims | | NO |
| Industrial applicability (IA) | Claims | 1-29 | YES |
| | Claims | | NO |

2. Citations and explanations (Rule 70.7)

1. The present report refers to the following documents:

D1: US 4 638 084 A (SINGELTON DAVID M) 20 January 1987

D2: EP-A-0 475 386 (UNIV NORTH CAROLINA) 18 March 1992

D3: WO 96/34687 A (UNION CARBIDE CHEM PLASTIC) 7 November 1996.

2. Novelty

2.1 Documents D1 and D2 describe discontinuous methods for the rhodium-catalyzed dimerization of alkyl acrylates into the corresponding esters of hexenedioic acid. Document D1 further mentions the transformation of these into adipic acid by hydrogenation and soaping.

The subject matter of independent claim 1 therefore differs from these known methods in that the reaction product is first distilled, then the bottom product of the distillation is split using

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a semipermeable membrane, and finally a permeate depleted of higher addition products is returned to the dimerization process.

- 2.2 Document D3 describes the separation of rhodium catalysts from a hydroformylation mixture using a semipermeable membrane.
- 2.3 The subject matter of independent claim 1 and claims 2-29, which are dependent thereon, is therefore novel (PCT Article 33(2)).
3. Inventive step

Document D2 can be considered the closest prior art.

The problem to be solved by the present invention is therefore understood to be that of providing a continuous method for the production of a compound carrying at least two functional groups independently selected from the group consisting of the nitrile group, carboxylic acid group, carboxylic acid ester group and carboxylic acid amine group.

The solution to this problem, as proposed in independent claim 1 of the present application and claims 2-29, which are dependent on claim 1, involves an inventive step (PCT Article 33(3)), for the following reasons:

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The separation of rhodium catalysts using membranes is known per se from the prior art (document D3). However, to a person skilled in the art it was not obvious to modify the known methods for the dimerization of acrylic derivatives (document D1 and D2) in such a way that a part of the target product is obtained in the form of a top product of a distillation while a further part remains in the bottom product together with the high-boiling components and the catalyst and together with the catalyst is then separated from the high-boiling components using a membrane and returned to the reaction.

4. Clarity

Independent claim 1 c) defines the subject matter only in terms of the result to be achieved (concentration of the high-boiling components in the retentate). However, the technical features essential for obtaining this result, for example those concerning the structure of the membrane, are not contained in claim 1.